Preface

Trauma Report Fiscal Year 2000, examines the history of trauma system development nationwide as well as in Mississippi. This is the fourth published report for the Mississippi Trauma Care System. This report is also an appendix to the *Emergency Medical Services Fiscal Year Report 2000*.

The Division of EMS is committed to the development of a statewide trauma system to ensure Mississippians receive quality trauma care. In the coming year, many steps will be taken toward the goal of a complete trauma care system.

To use *Trauma Report Fiscal Year 2000*, the reader should refer to —

Chapter 1
Trauma, The Neglected Disease of Modern Society

During the mid 1960s, the National Research Council issued a white paper labeling trauma "the neglected disease of modern society." In 1985, the book *Injury in America; A Continuing Public Health Problem* confirmed that little progress had been made and that the neglected disease remained neglected. During that time period, numerous published trauma death studies demonstrated that as much as one third of trauma deaths occurring in areas without organized trauma care systems were preventable.

The American College of Surgeons developed criteria for the designation of trauma centers and the establishment of trauma systems. States and regions of states that have adopted these criteria or similar trauma care standards have experienced a dramatic reduction in the percentage of preventable deaths. Despite the documented effectiveness of trauma systems, most states have yet to implement them.

Recognizing this fact, the National Highway Traffic Safety Administration developed and implemented a curriculum (*Development of Trauma Systems: A State and Community Guide*) to emphasize the trauma problem nationally and to teach concepts in developing trauma systems during the 1990s. Then Congress of the United States further proclaimed the need for trauma care programs through passage of the Trauma Systems Planning and Development Act of 1990. This Act provided a significant federal funding program for this disease category.

The passage of legislation during the 1991 Mississippi legislative session designated the Division of Emergency Medical Services (DEMS), Mississippi State Department of Health (MSDH), as the lead agency for trauma systems development in Mississippi.

Amendment to the EMS Act of 1974

The State Department of Health, Division of Emergency Medical Services, acting as the lead agency, in consultation with and having solicited advice from the EMS Advisory Council, shall develop and submit to the Legislature a plan for the triage, transport and treatment of major trauma victims that at minimum addresses the following:

- The magnitude of the trauma problem in Mississippi and the need for a statewide system of trauma care;
- The structure and organization of a trauma care system for Mississippi;
- Prehospital care management guidelines for triage and transportation of major trauma victims;
- Trauma system design and resources, including air transportation services, and provision for interfacility transfer;
- Guidelines for resources, equipment and personnel within facilities treating major trauma victims;
- Data collection and evaluation regarding system operation, patient outcome and quality improvement;
- Public information and education about the trauma system;
- Medical control and accountability;
- Confidentiality of patient care information;
- Cost of major trauma in Mississippi; and
- Research alternatives and recommendations for financial assistance of the trauma system in Mississippi, including, but not limited to, trauma system management and uncompensated trauma care.

Since the passage of this law, the Trauma Care Plan for the State of Mississippi has been written and adopted. DEMS has now begun implementation of the plan.

The first step DEMS took in developing a statewide trauma system was the implementation of a statewide trauma registry. In 1992, DEMS began the organizational process for issuing a request for proposal (RFP) from three vendors: TriAnalytics, the American College of Surgeons, and Cales and Associates. Strict criteria were established by DEMS and outside consultants to ensure the registry would meet the needs of the state. After a stringent review process, Cales and Associates was awarded the contract in 1993. The original contract consisted of licenses for five registry sites, along with the state registry software. The trauma registry was then installed in the five regional trauma centers strategically located throughout the state:

- Forrest General Hospital, Hattiesburg
- Greenwood-Leflore County Hospital, Greenwood
- North Mississippi Medical Center, Tupelo
- Singing River Hospital, Pascagoula
- University of Mississippi Medical Center, Jackson.

In 1997, DEMS purchased the statewide license agreement from Cales and Associates making the Hospital Trauma Registry available to any Mississippi hospital wanting to participate in the State Trauma Registry System. The registry is currently being implemented in several hospitals statewide. This expansion will provide a stable foundation for the development of a statewide trauma system.

The 1997 Legislature created the Mississippi EMS Trauma Care Task Force to research the status of trauma and its significance in the state. The membership of the task force was as follows:

- The Director of the Division of Emergency Medical Services
- Representative from each of the five original trauma registry hospitals
- Physician appointed by the Mississippi Chapter of the American College of Surgeons
- Physician appointed by the Mississippi Chapter of the American College of Emergency Physicians
- Emergency Medical Technician appointed by the State Department of Health
- Registered Nurse appointed by the State Department of Health
- Two members of the House of Representatives
- Two members of the Senate
- Representative of the Mississippi Hospital Association
- Member of the Governor's staff
- Victim of trauma appointed by the Governor.

The task force focused on three developmental areas for the implementation of a statewide trauma system. These are:

- Prevention and public awareness
- Financial support and legislative authority
- Prehospital and hospital standards of trauma care.

The recommendations of the TCTF were formalized into a report that was due to the Governor and Legislature on December 15, 1997.

H.B. 966 — Mississippi Trauma Care System Act

The 1998 Legislature took to heart the report given to them by the Trauma Care Task Force and passed legislation giving the Division of Emergency Medical Services, Mississippi State Department of Health the authority to develop a statewide trauma care system. It also expands the existing EMS Advisory Council to include trauma care professionals, which make up the Mississippi Trauma Advisory Committee (MTAC). The MTAC is composed of

representatives from the following associations plus other EMS Advisory Council members appointed by the Chairman:

- Neurosurgeon appointed by the State Medical Association
- Registered Nurse appointed by the Emergency Nurses Association
- Emergency Medical Technician-Paramedic appointed by State Board of Health
- Representative appointed by the Mississippi Dept. of Rehabilitative Services
- Victim of Trauma appointed by the Governor
- Regional Representative from each designated trauma region (currently 7).

Finally, H.B. 966 provides permanent funding through a $5 assessment on all moving traffic violations, creating the Trauma Care Trust Fund. This money will be available for administrative functions at both the state and regional levels.

The passage of this legislation means many things to different entities. Participation in the statewide system is voluntary. Hospitals and medical staff will make the decision to participate. If an acute care facility decides to participate, it will work in conjunction with other facilities in its region to develop regional plans and protocols. Pre-hospital providers will receive new trauma specific training, new field triage protocols, and will become more involved in the evaluation of patient outcomes. What H.B. 966 means to Mississippians is the Right Patient will be sent to the Right Hospital in the Right Amount of Time. This will result in reduced morbidity and mortality to the citizens of our state.

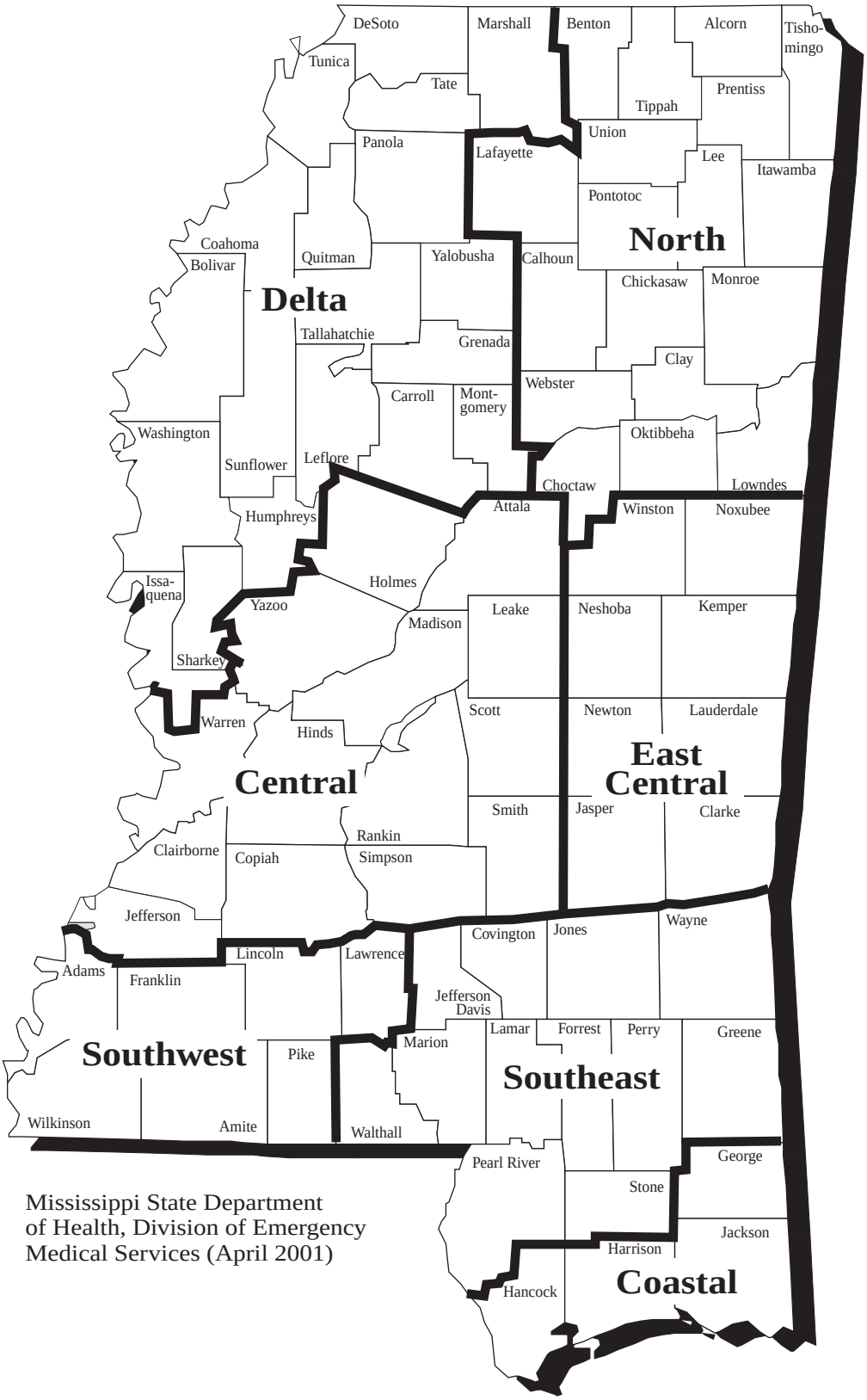
In 1998, the MTAC developed the Mississippi Trauma Care Regulations that were subsequently adopted by the State Board of Health in October, 1998. These regulations describe the requirements for regional plan development and the trauma center designation process. They also state the hospital requirements for trauma program development, which include the entire continuum of care from injury to rehabilitation.

The Mississippi legislature added $6 million to the Trauma Care Trust Fund during the 1999 Legislature Session. These additional monies brought the total amount in the Trauma Care Trust Fund to about $8 million per year. Legislators authorized annual funding for regional support and uncompensated trauma care as defined by the trauma registry through regional contracts with the Department of Health, payable from the fund.

The funds became available on July 1, 1999, for designated trauma care regions through annual contracts with the State Department of Health, Division of Emergency Medical Services. The first checks were distributed in FY'00 after hospital designations were announced for Level I and II trauma centers. A total of $6,538,545 was distributed from the Trauma Care Trust Fund for reimbursement of uncompensated care. The fund was divided between designated trauma centers and eligible physicians based on allocation of 70% to hospitals and 30% to eligible physicians.

Additionally in FY'00, seven trauma care regions were designated by the Mississippi State Department of Health. Each designated region established 501-C-3 not-for-profit organizational status, which allows DEMS to contract with them to develop and implement a regional trauma plan. Below is a map of the seven designated trauma regions.

Mississippi
Trauma Care Regions



Source: Mississippi State Department of Health, Division of Emergency Medical Services (April 2001)

In FY'00, the Mississippi State Department of Health provisionally designated a total of six trauma centers which include one Level I trauma center and five Level II trauma centers. Each Trauma Center must be re-inspected after 15 months to evaluate correction of deficiencies noted in the initial inspection. Additional hospitals are participating and have applied to be inspected in FY'01.

Below is a chart representing the designated hospitals and their levels.

Mississippi Designated Trauma Care Centers as of June 30, 2001

Fredrick D. Woodrell	Associate Vice Chancellor	University Medical Center 2500 North State Street Jackson, MS 39216-4505	Level I
Douglas L. Johnson	Administrator	Baptist Memorial Hospital - Golden Triangle P. O. Box 1307 Columbus, MS 39701	Level II
Robert Otwell	Administrator	North Mississippi Medical Center 830 South Gloster Street Tupelo, MS 38801	Level II
Bart Hove	CEO	Delta Regional Medical Center P.O. Box 5247 Greenville, MS 38704-5247	Level II
Lynn Truelove	Administrator	Singing River Hospital 2809 Denny Avenue Pascagoula, MS 39581	Level II
William Oliver	Administrator	Forrest General Hospital P. O. Box 16389 Hattiesburg, MS 39404	Level II

Finally, in FY'00, the Division of EMS developed a Request for Proposals, in search of a new trauma registry software vendor. The contract was awarded to Lancet Technology, Inc., of Boston, Massachusetts. This was the beginning of the statewide deployment of the trauma registry software to all participating hospitals. The registry was installed in over 60 hospitals, where trauma data began being collected. The registry serves three purposes. The first, and most important function of the trauma registry software is for performance improvement activities within the hospital. The data collected by participating hospitals allows the hospital to monitor and improve its trauma program. The second function is for participating hospitals to provide data to the region in which it is participating. The region will utilize the data to develop and monitor prehospital triage protocols, transfer agreements, and policies. Finally, each participating hospital submits data to the State Trauma Registry. The data is utilized for injury prevention activities, legislative initiatives, and monitoring of the Trauma Care Trust Fund. The data captured in the State Trauma Registry is the basis for the information in this report.

Not all trauma is entered into the trauma registry. Minor injuries that are treated by the initial facility and released are not included. Only major trauma that requires surgical intervention, a 3 or more day stay in the hospital, or exceeds that ability of the initial hospital and results in a transfer to a higher level of care are included. Case criteria include an injury diagnosis of (ICD-9-CM N-Code 800.00 through 959.9) and one or more of the following:

- Transfer to or from another acute care facility
- Admission to intensive care
- Hospitalization for 3 or more days
- Injury with an AIS value of 3 or higher or
- Died after receiving any evaluation or treatment.

Chapter 2
Demographics and Injury Severity

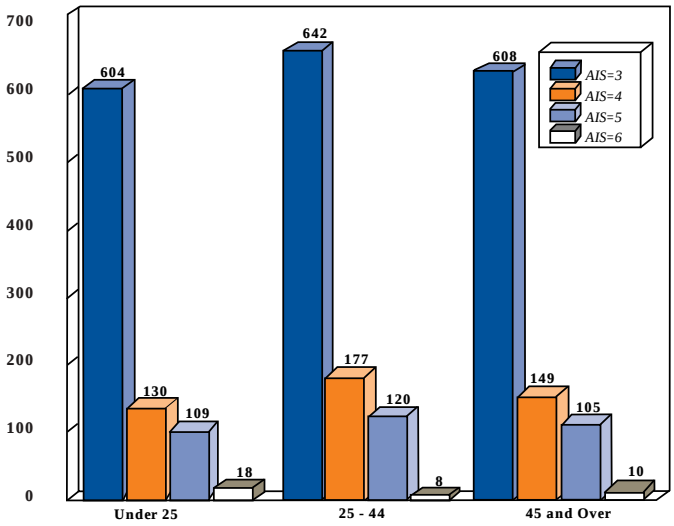
In the United States, injury is recognized as a major public health problem. Trauma (unintentional and intentional) is the fourth leading cause of all deaths for all age groups. The shocking fact is that trauma is the number one cause of death among persons age 0-44. More than 135,000 people die from traumatic injury every year in this country. Between eight and nine million people suffer disabling injuries in the United States annually, with more than 300,000 of them suffering permanent disability. Accidental deaths were the leading cause of death in Mississippi with a total of 1,639 occurrences. Over 75,000 years of potential life lost before age 75 occurred in Mississippi in 1999 for all accidental deaths, homicides, and suicides.

The Abbreviated Injury Scale (AIS) is an anatomical scoring system first introduced in the late 1960's. It has been revised and updated against survivability outcomes of patients. Now it provides a fairly accurate method of ranking the severity of injury. AIS, which had it's latest revision in 1998, is monitored by a scaling committee of the Association for the Advancement of Automotive Medicine.

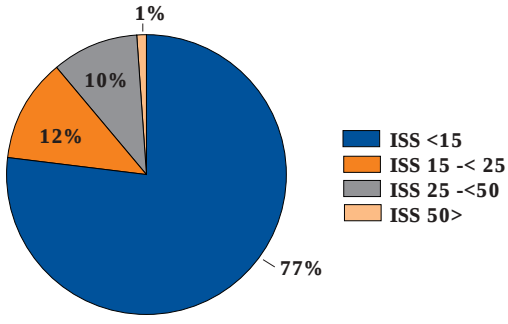
Injuries are ranked on a scale of 1 to 6. This represents the "threat to life" associated with an injury and is not meant to represent a comprehensive measure of severity. An injury with a score of 1 is considered to be a minor injury, an injury with a 5 is critical and 6, unsurvivable.

The Injury Severity Score (ISS) is an anatomical scoring system that provides an overall score for patients with multiple injuries. Each injury is assigned an AIS score and is allocated to one of six body regions – Head, Face, Chest, Abdomen, Extremities (including Pelvis), and External. Only the highest AIS score in each body region is used. The 3 most severely injured body regions have their score squared and added together to produce the ISS score. The ISS score takes values from 0 to 75. If an injury is assigned an AIS of 6, which is an unsurvivable injury, the ISS score is automatically assigned to 75. The ISS score correlates with mortality, morbidity, hospital stay, and other measures of severity.

In FY'00, 5,583 patients were submitted to the State Trauma Registry from hospitals providing the final phase of care, excluding rehabilitation. Of these, 34 percent were under the age of 25, 35 percent were between the ages of 25-44, and 31 percent were ages 45 and over. The total number of injuries sustained were over 13,000. However, over 66 percent of all injuries were minor injuries with AIS values of 1 or 2. Most of these injuries were received in conjunction with other more serious injuries. The chart below depicts age versus the injury with the highest AIS value per patient.



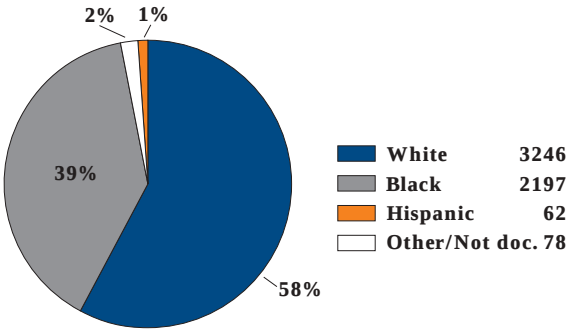
The graph below shows the percentages of patients in each ISS category.



The average ISS for patients in FY'00 was 10.6, with the median ISS being 9. Low ISS scores are common when trauma registries are first implemented in hospitals. Lack of documentation and improper scoring techniques result in inaccurate scores. As programs develop and more education is done on documentation and scoring of trauma patients, ISS values will depict more accurately the severity of injury of patients in Mississippi.

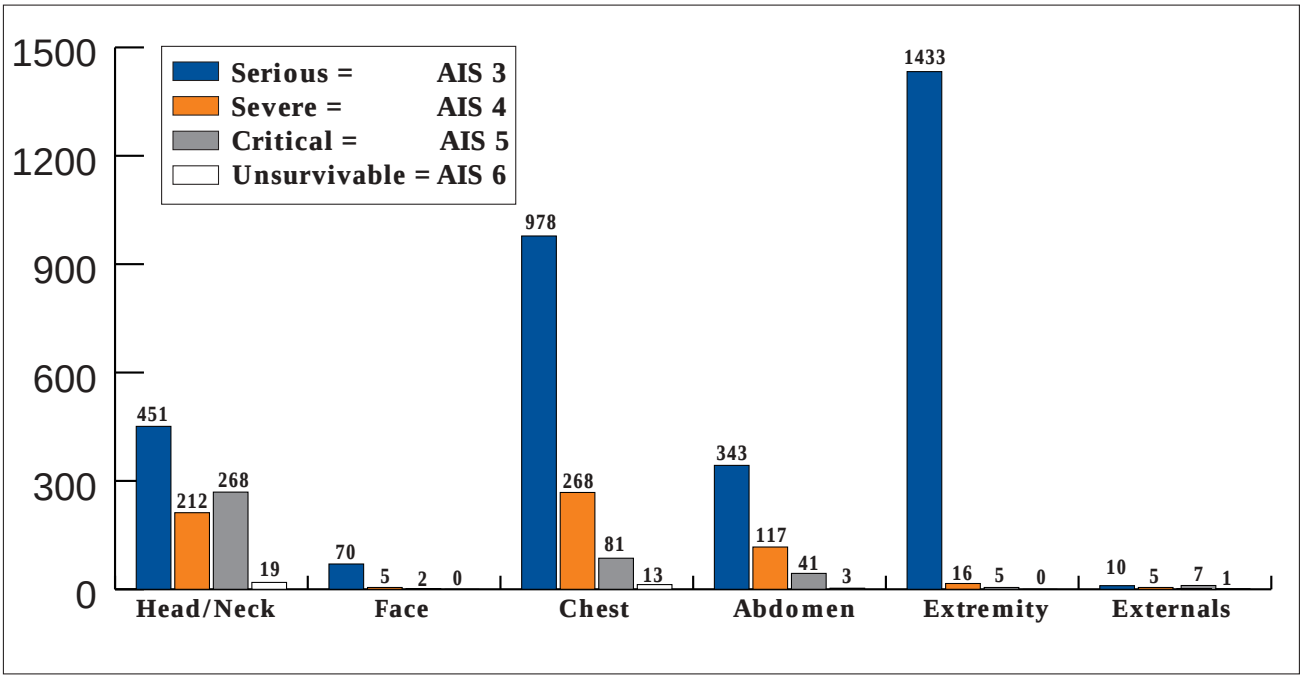
The number of males entered into the state trauma registry was nearly double the number of females, with males making up 66 percent of the total population. However, there was an insignificant difference in severity of injury between the sexes.

The chart below shows the breakdown of race.



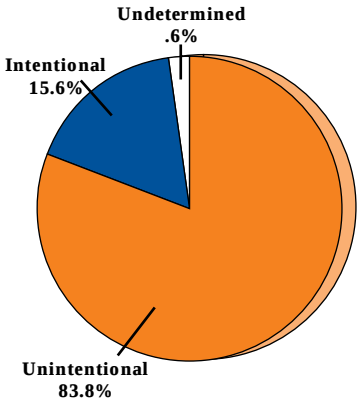
AIS values are assigned to 6 different body regions. As stated previously, over 13,000 injuries were reported in FY'00. Below is the breakdown of anatomical injury severity scores by body region.

In FY'00, 403 trauma registry patients expired. The average ISS for all deaths was 28.3. The average ISS for patients that lived was 9.3. The total number of records submitted in FY'00 was 7,848. Of these, 2,265 patients were transferred to a higher level of care. The average ISS of transferred patients was 6.8. The ISS values are low for transferred patients because of a lack of diagnostic abilities at the transferring hospital. Many injuries, especially internal, are not properly diagnosed until the patient reaches definitive care.



Chapter 3
Types of Injuries and How They Occur

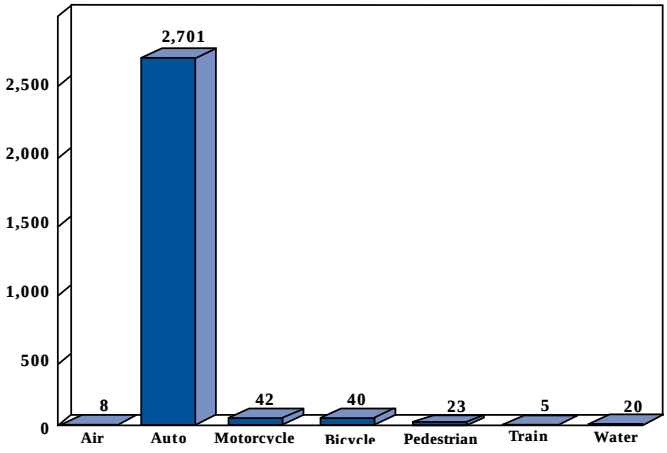
Injuries are classified as intentional, unintentional, or undetermined. Unintentional injuries accounted for nearly 84% of all injuries reported in the State Trauma Registry for FY'00. The breakdown of injuries is shown below.



Unintentional Injuries	Percent
Fall	20.1%
Transportation	60.8%
Other	19.1%

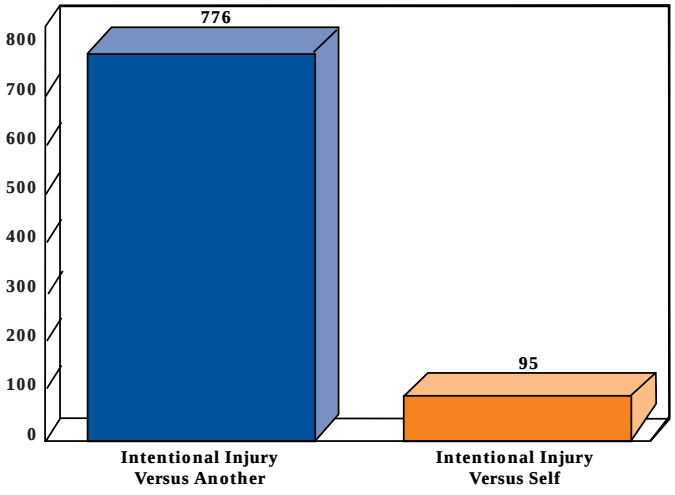
Intentional Injuries	Percent
Versus Another	89.0%
Versus Self	10.9%
Legal intervention	.1%

Nearly 95% of all unintentional injuries were caused by motor vehicle crashes in FY'00. Below are other transportation injuries.



Other unspecified injuries account for 19.1 percent of unintentional injuries. Some of these include bites, crushing by objects or machinery, firearms, lightning, cuts, etc. Improvement in documentation and coding will help identify more specifically these other injuries.

Intentional factors resulted in 871 injuries in FY'00. Intentional injuries are classified as caused either by self or by another person. The breakdown is below:

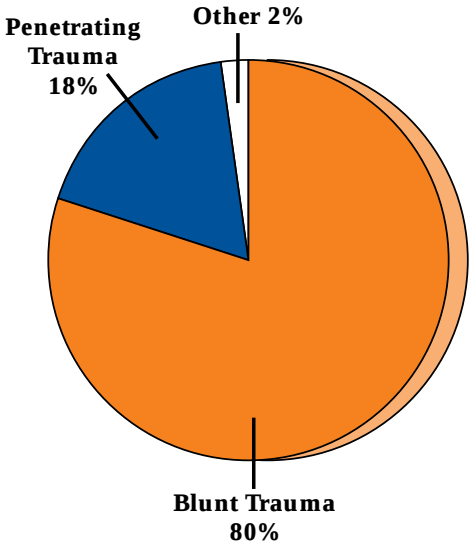


Intentional Injury Versus Another	Percentage
Firearm	41%
Pierce/Cut	22%
Striking w/object	16%
Other/Unspecified	21%

Intentional Injury Versus Self	Percentage
Firearm	58%
Pierce/Cut	24%
Poisoning/Overdose	8%
Other/Unspecified	10%

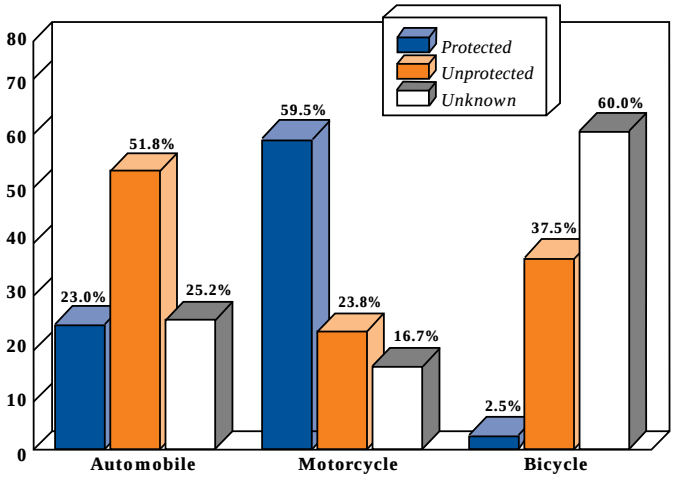
Firearms resulted in injury to 451 patients in FY'00, unintentional as well as intentional. The average ISS for these patients was 12.9. Eighty-six percent of these patients were males, with 73% of patients being black. White gunshot wound victims equaled about 24%, while other races constituted less than 3%. The average age of these victims was approximately 30 years of age with the median being 28 years.

It is often a misconception that a high percentage of trauma is penetrating. The numbers to the right show that in FY'00 this was not the case.



Chapter 4
Efforts to Prevent Injuries

The use of protective devices in prevention of injury is slowly increasing. Nearly 52% of injuries sustained in automobile accidents were unprotected. Over 20 percent of traumatic injuries sustained in motorcycle accidents were unprotected. The statistics below show the number of patients reported to the State Trauma Registry that were protected, unprotected, or unknown. These statistics are not indicators of protective device usage.



In FY'00, 8,289 injuries resulted from motor vehicle crashes, 120 from motorcycle incidents, and 76 from bicycle incidents. Shown below are the number of the most severe injuries sustained from these three causes of injury with the listed protection device. (Note: Not included are all minor injuries with AIS values of 1 or 2)

Outcome - Automobile - Injuries

	AIS 3	AIS 4	AIS 5	AIS 6
Air Bag	49	7	3	0
Belt/Bag	83	0	2	2
Child Seat	7	1	0	0
Seat Belt	291	40	2	2
Other	398	66	54	3
None	1082	221	152	18

Outcome - Motorcycles - Injuries

	AIS	AIS 4	AIS 5	AIS 6
Helmet	2	6	3	1
None	6	1	1	0
Unknown	6	1	0	0

Outcome - Bicycles - Injuries

	AIS 3	AIS 4	AIS 5	AIS 6
Helmet	1	0	0	0
None	5	0	0	0
Unknown	11	4	1	0

Alcohol and drug usage play important parts in many traumatic injuries sustained. In some instances, a blood alcohol and/or drug test was performed upon arrival at the hospital. Not all people were tested. Listed are the results from those tested for the presence of alcohol and/or drugs.

Alcohol Test Results —

	Tested	Present
Automobile	912	574
Motorcycle	16	12
Bicycle	3	3
Pedestrian	9	9
Fall	81	12
Assault	278	197
Self-Inflicted	48	24
Total	1423	831

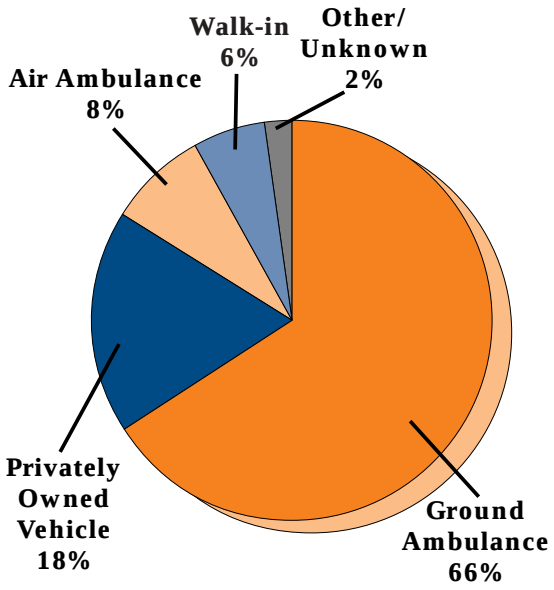
Drug Test Results —

	Drugs Present
Automobile	675
Motorcycle	8
Bicycle	2
Pedestrian	2
Fall	17
Assault	222
Self-Inflicted	34
Total	960

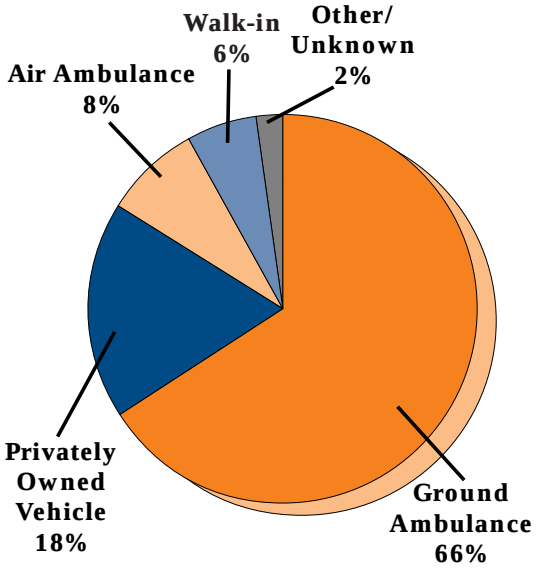
Chapter 5
Care and Length of Stay

In FY'00, over 66% of trauma registry patients arrived at the facility of definitive care by ground ambulance, while 56% of patients that resulted being transferred to a higher level of care arrived at the transferring facility by ground ambulance.

Below shows the method of emergency department arrival at the definitive care facility.



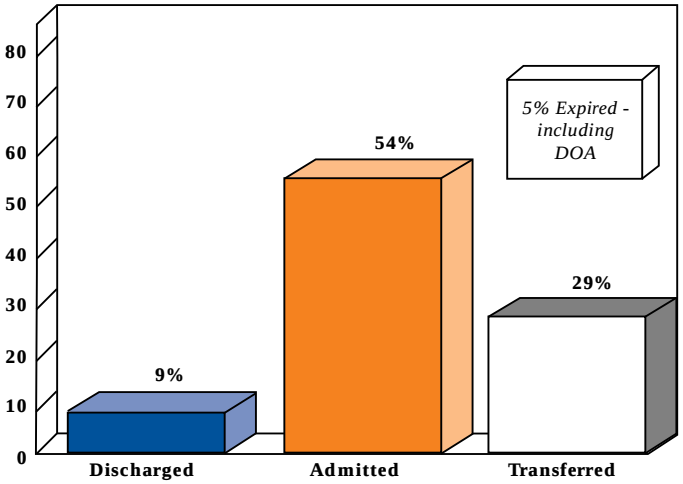
Below shows the method of emergency department arrival at the transferring facility.



The table below shows the breakdown of hospital trauma admissions by day of the week.

Day —	Percentage of Totals
Sunday	17%
Monday	13%
Tuesday	12%
Wednesday	13%
Thursday	13%
Friday	15%
Saturday	18%

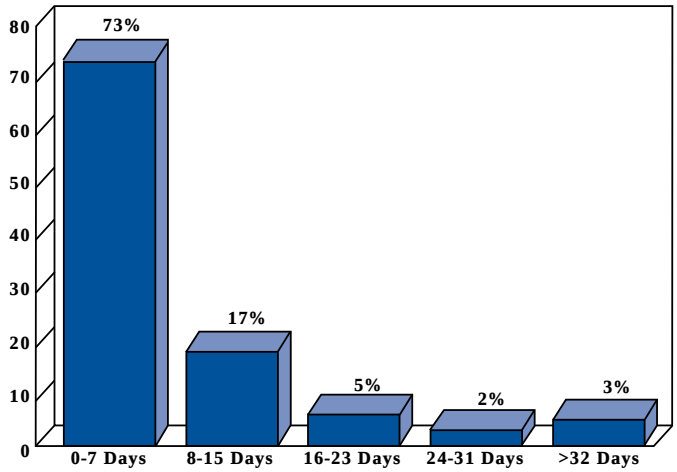
Once patients are admitted to the emergency department and treated, they are sent to the operating room, admitted to the hospital, transferred to another facility or are released from the hospital. Fifty-four percent of trauma patients in FY'00 were admitted to the reporting hospital. The breakdown of emergency department dispositions is below.



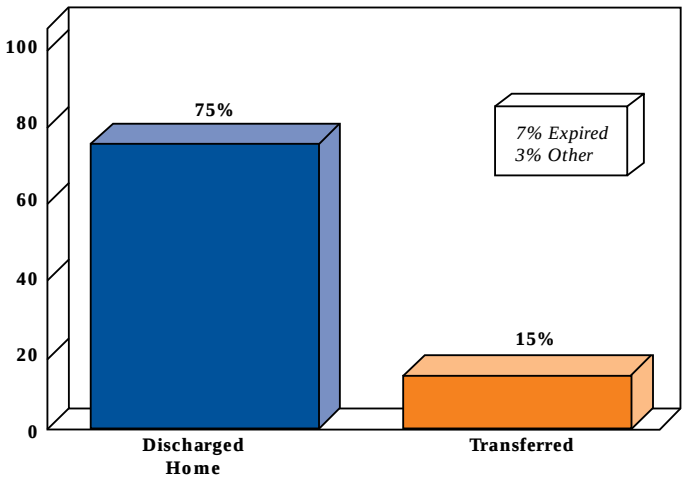
Admitted to Hospital	Percentage
Directly to Observation	less than 1%
Directly to Floor	52%
Directly to Stepdown	less than 1%
Directly to ICU	20%
Directly to Operating Room	28%

The average hospital length of stay (LOS) for trauma patients in FY'00 was 7.05 days, with the median being 4 days. The breakdown of hospital LOS for trauma patients is shown below.

Length of Stay — Hospital



Seventy-five percent of trauma patients discharged from the hospital in FY'00 were discharged home. The breakdown of hospital discharge dispositions below:



Transferred to	Percentage
Acute Care Hospital	50%
Other	2%
Rehabilitation Facility	26%
Skilled Nursing Facility	18%
Long-Term Care Facility	4%

Of those patients discharged to other facilities, 26% went to a rehabilitation facility. Of those patients referred to rehab, 21% were discharged with mild or no disability.

Rehabilitation	Number
No Disability	13
Mild Disability	28
Good Potential Moderate Disability	111
Poor Potential Severe Disability	39
Permanent Vegetative State	3
Total	194

Organ donations coming from trauma patients in the State Trauma Registry in FY'00 reported 111 requests resulting in the following donations.

Heart	7
Bone	6
Liver	6
Kidneys	6
Corneas	5
Skin	4
Pancreas	4
Lungs	2
Eyes	1
Other/Multiple Organs	12

The other requests for donations were either refused or unsuitable.

References

- National Vital Statistics Report, Vol 47, No. 4, 32-33:October 7, 1998
- Vital Statistics Mississippi 1999, Mississippi State Department of Health, 30:1999
- Copes WS, Sacco JW, Champion HR, Bain LW, “Progress in Characterizing Anatomic Injury”, In proceedings of the 33rd Annual Meeting of the Association for the Advancement of Automotive Medicine, Baltimore, MA USA 205-218
- Baker SP et al, “The Injury Severity Score: a method for describing patients with multiple injuries and evaluating emergency care”, J Trauma 14:187-196:1974

Notes

Notes

Notes